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The Influence of Pelvic Adjustment on the Posture of Female University Students

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Abstract. [Purpose] The purpose of this study was to examine the effects of pelvic adjustment via the Gonstead Technique on the posture of female university students. [Subjects] The subjects of this study were 30 female university students who were equally and randomly allocated to a pelvic adjustment group, an experimental group, and a stretching group, a control group. [Methods] Using BackMapper, their trunk inclination (TIN), trunk imbalance (TIM), pelvic position (PPO), pelvic torsion (PTO), pelvic rotation (PRO), and position of their scapulae (PSA) were evaluated. [Results] The adjustment group obtained significant results in TIM, PPO, PTO, and PSA, while the control group obtained no significant results for any items. [Conclusion] Pelvic adjustment via the Gonstead Technique may be applied as a method to correct the posture of average adults.
Key words: Pelvic adjustment, Stretching, Posture

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INTRODUCTION

The pelvis is a structure between the hip joint and the lumbosacral area, and diverse muscles that are attached to it adjust their movement. The location of the pelvis is the most important element that determines the sagittal alignment and posture of the body[1)], and abnormal posture triggers diverse problems, including flat-back syndrome, cervical kyphosis, local organ ailments such as uterine prolapse, and gastric herniation[2)]. Asymmetry in upright posture is associated with various outcomes, such as the decreased loading of the affected side in stroke; degenerative changes of the hip, knee, and ankle joints and spine; or a leg length discrepancy[3)]. The lumbosacral joint affects the lumbar vertebra, and the location of the joint determines the location of the lumbar vertebra on the upper part. The angle of the joint may change according to the location of the pelvis. The location of the pelvis also may trigger epidemiological problems in the musculoskeletal system, and forward and backward tilt exercises of the pelvis may influence the stability of the spine and the alignment of the body. Therefore, the correct alignment of the pelvis is an important element of gait, and a incorrectly located pelvis may cause incorrect posture[4)].

The pelvis plays a crucial role in posture, and there have been many previous studies of stability and the posture of the pelvis that improved lumbopelvic stabilization and posture through bridge exercises[5)], mattress exercises[6)], and the use of a Swiss ball[7)]. However, these methods have disadvantages, such as requiring a great deal of time, a large amount of space, and the active participation of subjects. In contrast, pelvic adjustment is a therapeutic method that may be performed in a short time. There have been many previous studies that examined the effects of pelvic adjustment on functional leg length inequality[8)], foot pressure, and balance[9)], but there has been no study that examined the effects of one-time pelvic adjustment on changes in posture. Therefore, this study intends to examine the immediate effects of one-time pelvic adjustment on the posture of female university students.

SUBJECTS AND METHODS

Thirty university female students were selected, and they were equally and randomly assigned to a pelvic adjustment group, an experimental group, and a stretching group, a control group. Those who had problems with muscles, the skeletal system, or the neurological system, those who felt pain in the waist or the pelvis, those who had incorrect posture due to scars after a burn or a surgical operation, and those who performed regular exercise were excluded. A sufficient explanation of the intent of this study and the entire experiment was given to the subjects, and voluntary consent was obtained from them. The age, height, and weight of the experimental group were 22.5 ± 4.9 years old, 159.0 ± 6.3 cm, and 52.1 ± 6.1 kg, and the age, height, and weight of the control group were 22.2 ± 3.3 years old, 158.4 ± 5.6 cm, and 51.1 ± 8.5 kg. The χ^2 test was used for analysis of their gender, and an independent t-test was employed the analysis of their age, height, and weight. There were no statistically significant differences between the two groups in the above analyses ($p>0.05$), and they were considered homogeneous.

For the pelvic adjustment that was applied to the experimental group, a high-velocity low-amplitude technique in keeping with Gonstead's theory was used with the subjects

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Table 1. Comparison of TIN, TIM, PPO, PTO, PRO, and PSA between before and after intervention in each group (mean ± SD) (units: TIN, TIM, PPO, PTO, and PRO degree, PSA-mm)

Category	Group	Before intervention	After intervention
TIN	Adjustment group	2.4±1.9	1.2±0.9
	Stretching group	2.5±1.3	2.3±1.4
TIM	Adjustment group*	2.7±2.6	1.1±0.8
	Stretching group	2.5±1.5	2.7±1.6
PPO	Adjustment group*	2.5±1.5	1.1±0.8
	Stretching group	2.7±1.8	2.8±1.7
PTO	Adjustment group*	3.6±2.4	1.1±0.3
	Stretching group	3.2±2.9	3.4±2.6
PRO	Adjustment group	2.5±2.3	1.4±0.7
	Stretching group	2.5±2.0	2.3±2.2
PSA	Adjustment group*	5.5±3.8	2.8±1.4
	Stretching group	5.1±3.4	4.7±3.1

*p<0.05; TIN, trunk inclination; TIM, trunk imbalance; PPO, pelvic position; PTO, pelvic torsion; PRO, pelvic rotation; PSA, position of scapulae

Table 2. Comparison of TIN, TIM, PPO, PTO, PRO and PSA between the adjustment group and stretching group (mean ± SD) (units: TIN, TIM, PPO, PTO, and PRO degree, PSA-mm)

	Category	Adjustment group	Stretching group
Before intervention	TIN	2.4±1.9	2.5±1.3
	TIM	2.7±2.6	2.5±1.5
	PPO	2.5±1.5	2.7±1.8
	PTO	3.6±2.4	3.2±2.9
	PRO	2.5±2.3	2.5±2.0
	PSA	5.5±3.8	5.1±3.4
After intervention	TIN*	1.2±0.9	2.3±1.4
	TIM*	1.1±0.8	2.7±1.6
	PPO*	1.1±0.8	2.8±1.7
	PTO*	1.1±0.3	3.4±2.6
	PRO	1.4±0.7	2.3±2.2
	PSA*	2.8±1.4	4.7±3.1
Change between before and after intervention	TIN	1.1±2.2	0.2±2.1
	TIM*	1.5±2.4	−0.1±1.3
	PPO*	1.3±1.7	−0.1±2.1
	PTO*	2.4±2.5	−0.1±4.9
	PRO	2.7±3.5	0.3±5.0
	PSA	1.0±2.6	0.2±2.7

*p<0.05

in a prone position. The subjects were placed in a prone position, and their pelvic height was checked. An impact on the posterior inferior innominate bone was made in the anterior superior direction, and an impact on the anterior superior innominate bone was made in the posterior inferior direction. The therapist put one hand on top of the other hand and placed them on the posterior superior iliac spine or the ischial spine, and an impact was made using their weight, gravity, and acceleration[8]. This adjustment was conducted three to five times, and a skilled physical therapist with more than 10 years of experience performed it. The control group stretched the muscles around the pelvis, including the erector spinae muscle, rectus abdominis muscle, iliacus muscle, psoas major muscle, quadriceps femoris muscle, adductor muscle, and quadratus lumborum muscle in order to remove any imbalance of the muscles that might affect pelvic imbalance. For each muscle stretching, the therapist helped the subject conduct more stretching exercises in the maximum stretching position, and the subject maintained the stretching for 10 to 15 seconds. The subject returned to the starting position gradually, rested for 5 seconds, and stretched once more. The subject stretched three times for each position, which took 15 minutes.

For the measurement of postural changes, BackMapper (ABW, Frickenhausen, Germany), a three-dimensional spinal diagnostic imaging system, was employed. BackMapper is an apparatus that precisely measures spinal form, location, and degree of distortion, as if looking at the spinal form from the backward, forward, downward, and upward directions. It analyzes trunk inclination (TIN), the inclination of the sagittal plane; trunk imbalance (TIM), the inclination of the coronal plane; pelvic position (PPO), the left and right inclination of the pelvis; pelvic torsion (PTO), the degree of declination of the hip bone; pelvic rotation (PRO), the declination of the pelvis on the horizontal plane; and the position of the scapulae (PSA), the left and right height of the scapula. It is a device that may analyze the distribution of body muscles and fat, as well as the location of the skeleton, using various variables.

The measured data were analyzed by using the SPSS 12.0 KO (SPSS, Chicago, IL, USA) statistical program, and the collected data were presented as means and standard deviations. A paired t-test was used for analyzing the significance of the differences between subjects prior to and after the experiment, and an independent t-test was employed for analyzing the significance of the differences between the two groups. The significance level was set at α=0.05.

RESULTS

The adjustment group showd significant differences in TIM, PPO, PTO, and PSA, while the stretching group showd no significant differences in any items ($p<0.05$) (Table 1). According to the comparison of the results from before and after the intervention, as well as the changes between before and after intervention, there were no significant differences before intervention, there were statistical changes in TIN, TIM, PPO, PTO, and PSA after intervention, and there were statistical changes in the TIM, PPO, and PTO in terms of the changes between before and after intervention ($p<0.05$) (Table 2).

DISCUSSION

Correct posture affects appearance and is related to the efficiency of physical functions. Correct posture refers to an ideal arrangement of the musculoskeletal system, with

the pelvis at the center. The pelvis supports the abdominal area and connects the spine to the lower extremities, and it delivers weight from the spine to the lower extremities in a standing position, maintains correct posture, and makes the movement of the upper extremities smooth[10]. The neutral location of the pelvis is crucial for correct posture and adjusts the upper and lower body parts during movement, improving the activities of daily living and gait ability[11]. For correct posture, the normal location and stability of the pelvis are important. Although there have been many studies of the pelvis and posture concerning exercise, those on changes in posture immediately after pelvic adjustment have been rare. Accordingly, this study intended to examine whether postural changes occurred immediately after pelvic adjustment. According to the analysis of the results of postural changes after pelvic adjustment via the Gonstead Technique, there were immediate effects in terms of postural changes in female university students in TIM, the inclination of the coronal plane; PPO, the left and right inclination of the pelvis; PTO, the degree of declination of the hip bone; PRO, the declination of the pelvis on the horizontal plane; and PSA, the left and right height of the scapula. It is assumed that pelvic correction could bring about changes in postures as above because the pelvis is an important structure that supports the spine and conveys body weight to the lower extremities. However, the issue of how long pelvic correction will enable maintaining proper postures should be examined through future studies.

Previous research related to pelvic adjustment, including that of Alcantara et al. (2004), reported that a correction of rapid speed and low amplitude applied to patients with subluxation of the sacroiliac joint reduced pain and allowed the patients to return to work[12]; Park et al. (2012) noted that pelvic adjustment via the Gonstead Technique enhanced balance in 20 elderly people[9]; and Gong et al. (2011) observed that pelvic correction via the Gonstead Technique reduced functional leg length inequality, which in turn decreased differences in foot pressure[8]. The results of the previous studies showing that pelvic adjustment via the Gonstead Technique reduced leg length differences, improved balance, and decreased differences in foot pressure are similar to those of the present study: pelvic adjustment using the Gonstead Technique corrects female university students' posture. Nonetheless, these previous studies did not observe direct postural changes through pelvic adjustment. They utilized exercises such as bridge exercises[5], Swiss ball exercises[7], and mattress exercises[6] for postural stability and muscle balance. However, they had disadvantages in that they required a great deal of time, a large space, cognitive ability, motor ability, and the active participation of subjects.

Therefore, correcting the posture of patients who have degraded cognitive abilities or have difficulty with active participation in exercise due to decreased motor ability via pelvic adjustment will be helpful for them, and the researcher hopes this method will be actively used with these patients.

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